Tests of CF Flanges: M. Snow, Indiana

Issues relating to CF Flanges:

NOTE: CF and VCR seals are our standard in system

- Properties of CF flanges under internal pressures are not specified by manufacturers->need for testing. What to test?

- Internal pressure: how much can it hold?

3. Thermal cycling: will it develop a leak?

4. How do you know the cold test was valid?

What has been tested?

size	Flange material	O-ring material	Bolts (SS Washers)	Torques (in-lbf,size)	Internal Pressure
1.33	Al,SS	Al,Cu	Brass, SS	16,8-32 22,8-32	200 psid
2.75	Al, Ti, SS	Al,Cu	Brass, SS	62,1/4-20 96, 10-28	200 psid
4.5	SS	Cu	SS	120,5/16-24	200 psid
6	SS	Cu	SS	120,5/16-24	200 psid
8	SS	Cu	SS	120,5-16/24	200 psid

What was done?

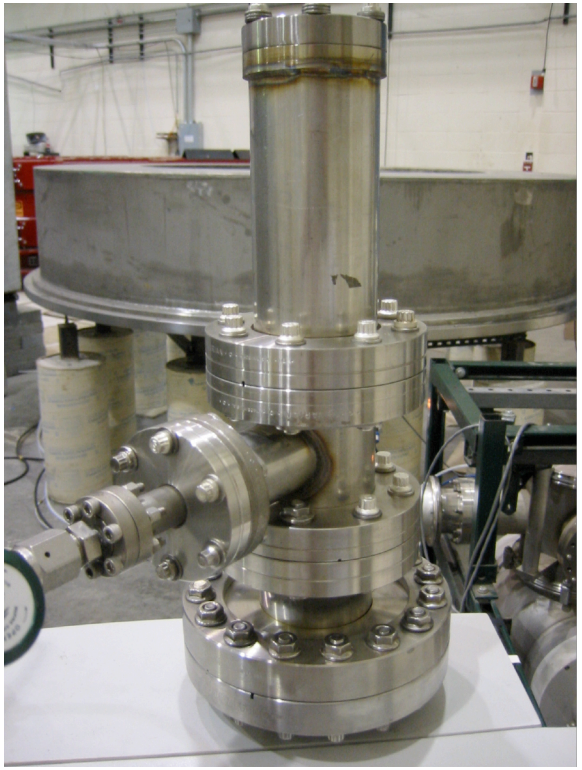
He leak test at room T, 200 psid internal pressure before cold cycling in bell jar, pressure gauge connected

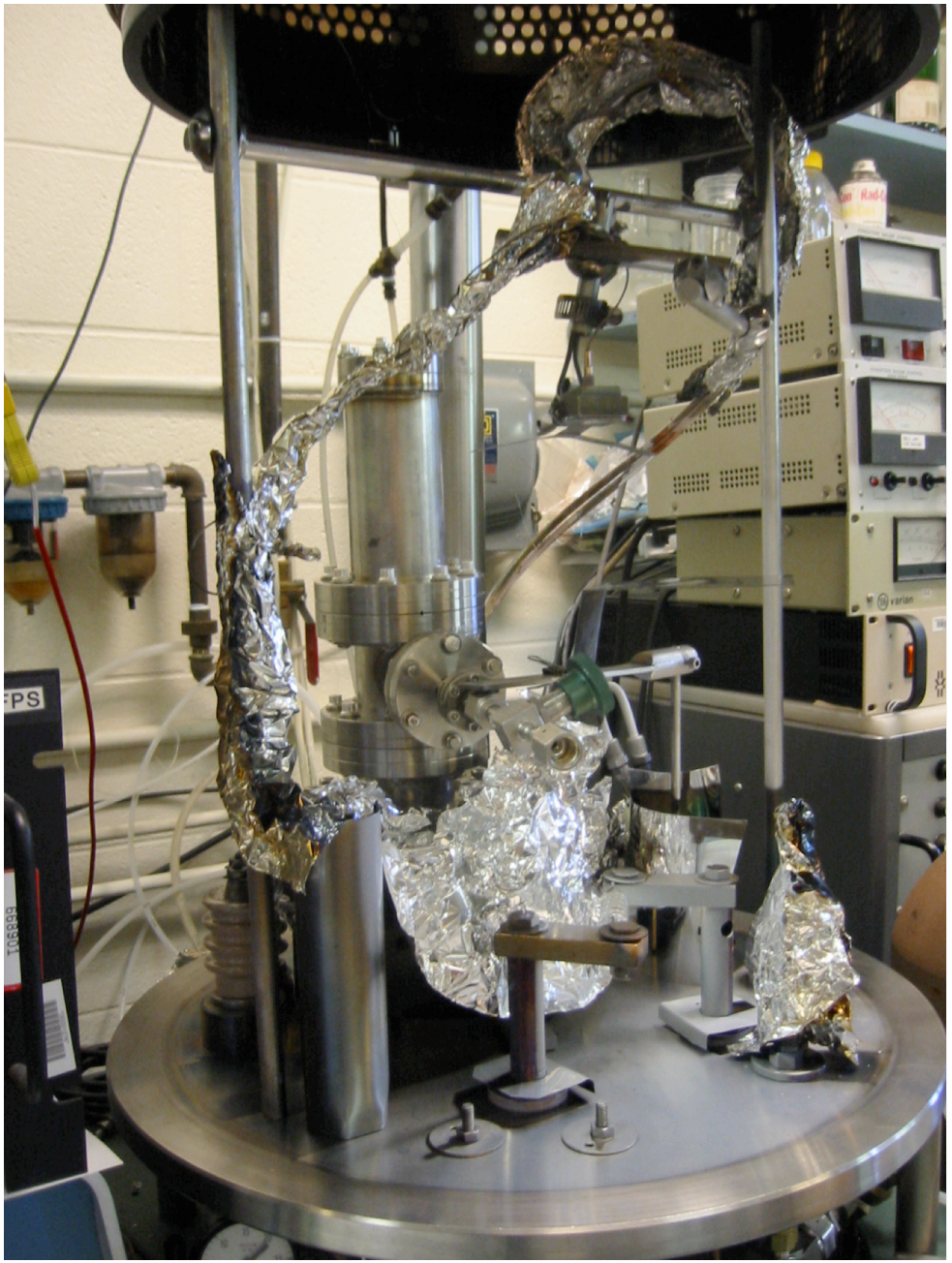
Thermally cycled to T~80K at least 6 times while internally pressurized (T of He gas verified by P gauge)

Last cycle: removed from under LN2 bath and quickly(~2 min) transferred to bell jar and evacuated, leak check

Removed, heated with heat guns to room temp. reinserted and leak checked again

Tests done at IUCF





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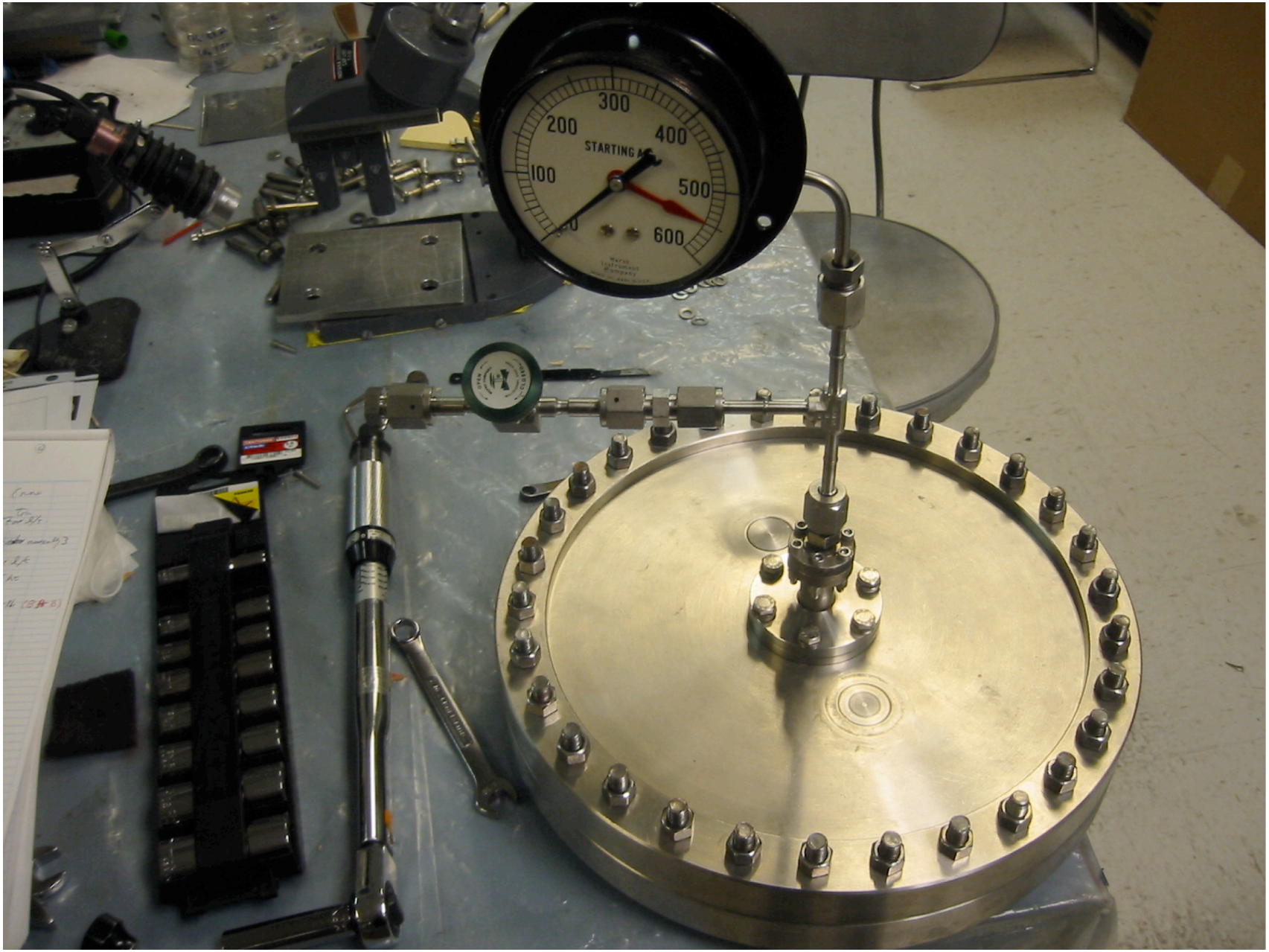

Leak rates (all E-10 torr-l/sec)

Test rig	CF Composition (SS understood)		Leak rate initial (bkgd)	Leak rate cold	Leak rate final
A	1.33, 2.75Al, Ti, 4.5, 6		1(1)	9(8)	1(1)
B	1.33, 2.75, 6,8		2.7 (1)	91(7.7)	250 (6)
D	2.75 Al, 2.75		1(1)	1(1)	1(1)
E	1.33 Al, 1.33		1(1)	19(8.5)	11(5.1)

What about leak plugging in air?

1. Intentionally introduce a 4E-6 leak at room T in a pair of 1.33 inch CF flanges with 200 psid He by loosening bolts (detect with sniffer)
2. Immerse in LN2, extract and bag immediately, get 1.7E-5 leak
3. Allow frost accumulation: leak =1.7E-5, 1.7E-5, 1.3E-5

after 5,10,15 minutes

4. Heat to room temp, leak 4E-6 wet, dry

->No evidence that frost plugged this leak

CONCLUSIONS:

1. No reason not to use Conflat flanges in system
2. Also being used at low T in other labs (JLAB)